

WHAT IS CLAIMED IS:

1. A method of inspecting patterns, comprising the steps of:

picking up a first pattern formed on a substrate to produce a first image;

storing said first image;

picking up a second pattern that is also formed on said substrate so as to have naturally the same shape as said first pattern, thereby producing a second image;

correcting at least one of said stored first image and said second image to match the brightness of said first image with that of said second image; and

comparing said first and second images matched in brightness to detect a defect of said patterns.

2. A method according to claim 1, wherein said step of matching the brightness of said first image with that of said second image is executed by means of a linear conversion having a gain and an offset so that the brightness of said first image can be made substantially equal to that of said second image.

3. A method according to claim 1, wherein said step of matching the brightness of said first image with that of said second image is executed by a local gradation conversion of at least one of said first and second images.

4. A method according to claim 1, wherein the surface of said substrate is covered with an optically

transparent film, and the surface of said optically transparent film is processed to be flat.

5. A method according to claim 1, wherein said step of picking up said first image and said step of picking up said second image are executed optically.

6. A method according to claim 1, wherein said step of picking up said first image and said step of picking up said second image are executed by use of an electron beam.

7. A method of inspecting a pattern, comprising the steps of:

picking up a first pattern formed on a substrate to produce a first image;

storing said first image;

picking up a second pattern that is formed on said substrate so as to have naturally the same shape as said first pattern, thereby producing a second image;

correcting at least one of said stored first image and said second image, and then comparing said first and second images to detect a defect and to obtain features of said detected defect; and

displaying information of said features of said detected defect on a screen.

8. A method of inspecting a pattern, comprising the steps of:

comparing a first image produced by picking up a first pattern formed on a substrate and a second image produced by picking up a second pattern that is formed

on said substrate so as to have naturally the same shape as said first pattern, thereby extracting defects to be proposed, and obtaining information of the certainty of said extracted proposed defects;

detecting a true defect from said extracted proposed defects; and

producing information of said detected true defect.

9. A method according to claim 8, wherein said certainty information of said defects is formed of a degree of inconsistency between said first and second images that results from comparing said first and second images, and a reliability of said degree of inconsistency.

10. A method according to claim 8, wherein said certainty information of said defects is the information produced on the basis of at least any one of the brightness, local contrast and local average of each of said first and second images.

11. A method according to claim 8, wherein said step of detecting said proposed defects includes a step of storing said first image produced by picking up said first pattern, a step of aligning said stored first image with said second image produced by picking up said second pattern, a step of correcting the brightness values of the said aligned first and second images, and a step of comparing said first and second images with their brightness values corrected to detect defects

including said proposed defects.

12. A method according to claim 11, wherein said alignment between said first and second images is performed for each pixel.

13. A method according to claim 8, wherein said substrate is a semiconductor wafer covered with an optically transparent film, and the surface of said optically transparent film is processed to be flat.

14. A method according to claim 8, wherein said correction of said brightness values of said first and second images is performed for each local area.

15. An apparatus for inspecting defects of patterns, comprising:

image pick-up means for picking up a first pattern formed on a substrate and a second pattern that is also formed on said substrate so as to have naturally the same shape as said first pattern, thereby producing a first image of said first pattern and a second image of said second pattern;

storage means for storing said first image picked up by said image pick-up means;

brightness conversion means for converting the brightness of any one of said first image stored in said storage means and said second image picked up by said image pick-up means;

defect detection means for comparing said first and second images at least any one of which is converted in its brightness, thereby detecting defects

of said patterns; and

~~output means for producing information of said defects of said patterns detected by said defect detection means.~~

16. An apparatus according to claim 15, wherein said brightness conversion means locally converts the gradation of at least any one of said first image stored in said memory means and said second image picked up by said image pick-up means.

17. An apparatus according to claim 15, wherein said brightness conversion means converts the brightness values of said first and second images being compared so as to make them substantially equal by a linear conversion having a gain and an offset.

18. An apparatus according to claim 15, wherein said image pick-up means optically picks up said first pattern and said second pattern.

19. An apparatus according to claim 15, wherein said image pick-up means picks up said first pattern and said second pattern by use of an electron beam.

20. An apparatus according to claim 15, wherein said output means displays on a screen the information of brightness, local contrast or local average of said first and second images.

21. An apparatus according to claim 15, further comprising shift correction means for correcting the positional shift between said first and second images with an accuracy of pixel unit, and wherein said

brightness conversion means converts the brightness of at least any one of said first and second images of which the shift has been corrected with an accuracy of pixel unit by said shift correction means.

22. An apparatus for inspecting defects of a plurality of patterns formed on a substrate so as to have naturally the same shape, comprising:

table means on which said substrate is placed, and which can be moved in an X-Y plane;

pick-up means for picking up said patterns of said substrate placed on said table means;

proposed-defects extracting means for processing said images of said patterns that are picked up by said pick-up means when said substrate placed on said table means is continuously moved, thereby extracting proposed defects of said patterns;

defect detection means for detecting true defects from said proposed defects of said patterns that have been extracted by said proposed-defects extraction means; and

output means for producing the information of defects detected by said defect detection means.

23. An apparatus according to claim 22, wherein said proposed-defects extraction means further estimates the information of certainty of said extracted defects on the basis of at least any one of brightness, local contrast and local average of said images.

24. An apparatus according to claim 22, further

comprising:

storage means for storing the images of said patterns picked up by said image pick-up means;

alignment means for aligning said pattern image stored in said storage means and said patterns picked up by said image pick-up means;

gradation correction means for correcting the gradations of said images aligned by said alignment means, and wherein said proposed-defects extraction means extracts proposed defects of said patterns by use of said pattern images corrected in gradation by said gradation correction means, and estimates the information of certainty of said proposed defects.

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25. An apparatus according to claim 22, wherein said alignment means aligns said pattern images stored in said storage means and picked up by said image pick-up means to match for each small division of said images.

26. An apparatus according to claim 24, wherein said gradation correction means corrects the gradations of each local parts of said pattern images stored in said storage means and picked up by said image pick-up means.

27. An apparatus for inspecting defects of patterns, comprising:

image pick-up means for picking up a first pattern formed on a substrate and a second pattern that is formed on said substrate so as to have naturally the

same shape as said first pattern, thereby producing a first image of said first pattern and a second image of said second pattern;

storage means for storing said first image picked up by said image pick-up means;

defect detection means for correcting at least one of said second image and said first image stored in said storage means, comparing said first image and said second image to detect defects, and then estimating information of said detected defects; and

display means for displaying on a screen said defects detected by said defect detection means, and the information of said defects.

28. An apparatus according to claim 27, wherein said defect detection means has a brightness correction portion for correcting the brightness of at least one of said first and second images, and said defect detection means compares said first and second images at least one of which has been corrected for its brightness by said brightness correction portion, thereby detecting said defects.

29. An apparatus according to claim 27, wherein said image pick-up means optically picks up said first and second patterns.

30. An apparatus according to claim 27, wherein said image pick-up means picks up said first and second patterns by use of an electron beam.

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